PATENT
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Application
for
United States Letters Patent

COLOR CHANGING NAIL POLISH

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COLOR CHANGING NAIL POLISH

CROSS REFERENCE

The Applicants claim the benefit of their Provisional Application No. 60/305,595, filed 07/19/2001.

BACKGROUND OF THE INVENTION

The present invention relates to nail polish and more particularly to a nail polish that has the ability of changing color upon exposure to heat and ultraviolet radiation, for example sunlight.

Nail polish comprises a class of products regularly used by women as part of their beauty care. Enamel nail polishes are commercially available indifferent colors and shades. Women use this beauty accessory to match their wardrobe, jewelry and makeup. However, to date there is no nail polish available in the market that can change color with changes in body heat of the wearer or upon exposure to sunlight (ultraviolet radiation).

Nail polish manufacturers have focused their work in producing a fast drying nail coat as shown by the numerous patents in this area. For example, U.S. Pat. No. 5,435,994 or U.S. Pat. No. 5,456,905. A photocurable nail lacquer has been developed by Rosenberg (see U.S. Pat. Nos. 3,896,014 and 3,928,113). The purpose of the idea was to develop a water removable nail coat instead of the usual acetone based remover. In U.S. Pat. No. 5,435,994,

Valenty describes a photoreactive nail polish coating composition that cures quickly upon exposure to low levels of ultraviolet radiation. The coating consists of a polymer formed from nitrocellulose, a photoreactive monomer, a photoinitiator, and a reaction inhibitor resulting in a product compatible with commercially available nail polish of any color. The coating is removable by commercially available acetone based polish removers. The nail polish dries in few minutes by the use of a small dose of UV radiation. In a subsequent patent, U.S. Pat. No. 5,456,905, Valenti describes a photoreactive nail polish that dries quickly upon exposure to natural light.

In U.S. Pat. No. 5,591,255, Small and Highberger teach a thermochromic ink formulation that is sensitive to temperature. In particular, they show a nail lacquer having the property of changing color with change of temperature. However, thermochromic dyes go from a color to no color therefore a color enamel has to be initially applied to produce the desired color change effect.

In U.S. Patent No. 5,730,961, Goudjil describes what he calls a metamorphic nail polish. This is capable of changing from clear to any visible color (violet, red, blue, yellow etc.) in presence of sunlight or any ultraviolet radiation source. The nail polish will go back to colorless as soon as it is removed from the sunlight or the UV source. The active chemical is a photochromic substance such as spiropyrans or spiroxazines. The photochromic compound is added to any clear nail polish to form a composition sensitive to UV radiation.

None of the references found show a nail polish capable of changing color as the ambient temperature changes and upon exposure to ultraviolet light (e.g., sunlight).

Development of a nail polish which can change color as the temperature changes and upon exposure to ultraviolet radiation represents a great improvement in the field of nail polishes and satisfies a long felt need of the nail polish wearers.

SUMMARY OF THE INVENTION

This invention is a nail polish which can change color as the temperature of the wearer changes and upon exposure to ultraviolet radiation. The nail polish comprises: a film forming chemical, a plasticizer, a solvent, a colorant, a temperature sensitive colorant, a UV absorber, an additive, a viscosity adjuster, and a photochromic powder. After the nail polish is applied to a nail and allowed to dry the combination of the colorant, temperature sensitive colorant and photochromic powder allow the nail polish to exhibit a first color when the nail is at normal body temperature, a second color when the temperature of the nail is above normal body temperature, and a third color when the nail polish composition is exposed to UV radiation.

An appreciation of the other aims and objectives of the present invention and an understanding of it may be achieved by referring to the accompanying drawings and description of a preferred embodiment.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

This invention comprises: a mixture of film forming chemicals, a mixture of plasticizers, a mixture of solvents, a mixture of colorants, a mixture of temperature sensitive colorants, a UV absorber, an additive, a viscosity adjuster, and a mixture of photochromic powders. The preferred ingredients and their composition ranges for this invention are provided in Table I.

Table I

Item Number	Ingredient	Function	Range %by weight
1	Ethyl Acetate	Solvent	21.00-38.00
2	Butyl Acetate	Solvent	16.00-24.00
3	Nitrocellulose	Film Former	6.00-10.00
4	Sucrose Acetate Isobutyrate	Plasticizer	1.00-7.00
5	Isopropanol	Solvent	1.00-4.00
6	Hydroxyethyl Acrylate - Butyl Acrylate - N-methoxyethyl Acrylate Copolymer Solution (1)	Film Former	1.00-3.00
7	Dibutyl Phthalate	Plasticizer	1.00-3.00
8	Benzyldimethlsterylarnmonirn Hectorite (1)	Viscosity Agent	1.00-2.00
9	DL-Camphor (1)	Plasticizer	0.25-1.00
10	Bismuth Oxychloride	Pearlescent Colorant	0.00-0.50
11	Yellow No.4 (1)	Colorant	0.00-2.50
12	Titanium Dioxide	Colorant	0.00-3.00
13	Benzophenone (1)	UV Absorber	0.10-1.00
14	Iron Blue (1)	Pigment-Colorant	0.00-3.00
15	Citric Acid	Additive	0.10-2.00
16	Black Iron Oxide (1)	Pigment-Colorant	0.00-2.00
17	Red #6 (1)	Pigment-Colorant	0.00-1.00
18	Red #7 (1)	Pigment-Colorant	0.00-3.00
19	Mica (3)	Pearlescent Colorant	0.00-5.00
20	Aluminum Powder (3)	Pearlescent Colorant	0.00-1.00
21	Red Iron Oxide (3)	Pigment-Colorant	0.00-0.50
22	Brilliant Rose (2)	Temperature Sensitive Colorant	0.00-2.00
23	Brilliant Green (2)	Temperature Sensitive Colorant	0.00-2.00
24	Brown (2)	Temperature Sensitive Colorant	0.00-1.00
25	Fast Black (2)	Temperature Sensitive Colorant	0.00-0.50
26	Fast Blue (2)	Temperature Sensitive Colorant	0.00-5.00
27	Gold Orange (2)	Temperature Sensitive Colorant	0.00-2.00
28	Magenta (2)	Temperature Sensitive Colorant	0.00-8.00

29	Yellow (2)	Temperature Sensitive Colorant	0.00-5.00
30	Pink (2)	Temperature Sensitive Colorant	0.00-3.00
31	Turquoise Blue (2)	Temperature Sensitive Colorant	0.00-3.50
32	Vermillion (2)	Temperature Sensitive Colorant	0.00-0.50
33	Acrylic Resin (2)	Plasticizer	0.25-4.00
34	Petroleum Resin (2)	Plasticizer	0.25-3.00
35	Aromatic Solvent (2)	Solvent	0.25-3.00
36	Red Powder (2)	UV Photochromic Powder	0.00-3.00
37	Purple Powder (2)	UV Photochromic Powder	0.00-0.60
38	Blue Powder (2)	uv Photochromic Powoer	0.00-0.50
39	Yellow Powder (2)	UV Photochromic Powder	0.00-1.00
40	Guanine (3)	Natural Pearlescent colorant	0.00-0.50
41	Chromicolor (2)	Temperature Sensitive Colorant	0.00-2.00

(1) Available from Tevco, Inc., South Plainfield, NJ

(2) Available from Matsui Shikso Chemical Co., Kyoto, Japan. US office: Matsui International Co, Inc., Gardena, CA

(3) Available from Merck KgaA, Darmstadt, Germany. US office: Rona, E.M. Industries, Hawthorne, NY

Some of the ingredients come premixed. For example, items 33, 34, 35 and 41 are supplied as Chromicolor Gravure Ink NC Base by Matsui Shikso Chemical Co., Kyoto, Japan. US office: Matsui International Co, Inc., Gardena, CA. Also, items 1-9, 1-19 and 22-31 can be procured premixed.

The film formers, plasticizers, solvents and other additives are designed to create a nail polish base that can be brushed onto a human nail to form a coating when dried. The colorants are of several varieties, namely pearlescent colorants, and pigment colorants. These are added to the base to impart a first color. This is the color that the nail polish exhibits when it is first applied. The temperature sensitive colorants change color as ambient temperature increases. These impart a second color to the nail polish as the temperature of the polish, actually of the wearer of the polish, increases. Only a small temperature change of about 0.5 °F is sufficient to effectuate this color change. The UV photochromic powders have the property of exhibiting different colors under visible and UV light. They impart a different color to the nail polish when it is exposed to UV light, as for example in broad sunlight.

Specific concentrations of ingredients, within the above referenced ranges, particularly the colored ingredients, are selected and mixed by standard procedures to produce a nail polish with the desired properties. After the nail polish is applied to a nail and allowed to dry the combination of the colorant, temperature sensitive colorant and photochromic powder allow the nail polish to exhibit a first color when the nail is at normal body temperature, a second color when the temperature of the nail is above normal body temperature, and a third color when the nail polish composition is exposed to UV radiation. Above normal body temperatures result, for example, when the individual exercises or exposes her hand to hot water. In other words a temperature rise of about 0.5 °F is sufficient to achieve the color change. When body temperature again falls to normal, the polish regains the first color.

EXAMPLES

Nail polishes were mixed according to the formulae in Table II.

Table II

Item Number	Ingredient	Formula A	B	C	D	E	F
1	Ethyl Acetate	23.20%	26.05%	28.93%	21.98%	22.87%	29.79%
2	Butly Acetate	18.90%	20.90%	20.84%	16.64%	18.90%	18.90%
3	Nitrocellulose	7.11%	7.11%	7.36%	6.11%	7.11%	7.11%
4	Sucrose Acetate Isobutyrate	2.00%	2.00%	1.99%	2.00%	2.00%	2.00%
5	Isopropanol	5.80%	5.80%	4.86%	3.66%	5.80%	5.80%
6	Hydroxyethyl Acrylate - Butyl Acrylate - N-methoxyethyl Acrylate Copolymer Solution	2.50%	2.50%	2.39%	2.50%	2.50%	2.50%
7	Dibutyl Phthalate	1.85%	1.85%	1.66%	1.00%	1.85%	1.85%
8	Benzyldimehtylsterylammonium Hectorite	1.25%	1.25%	1.24%	1.25%	1.25%	1.25%
9	DL-Camphor	0.78%	0.78%	0.75%	0.78%	0.78%	0.78%
10	Bismuth Oxychloride	0.25%	0.25%	0.23%	0.25%	0.25%	0.25%
11	Yellow No. 4	0.10%	0.10%	0.10%	0.10%	2.25%	0.32%
12	Titanium Dioxide	2.50%	2.50%	0.65%	2.50%	2.50%	2.50%
13	Benzophenone	0.65%	0.65%	0.78%	0.65%	0.65%	0.65%
14	Iron Blue	1.20%	1.20%		2.00%	1.20%	2.11%
15	Citric Acid	2.00%	2.00%	2.00%	2.00%	2.00%	1.98%
16	Black Iron Oxide	1.50%	1.50%		1.48%	1.50%	
17	Red # 6	0.34%	0.34%	1.00%	0.34%	0.34%	0.34%
18	Red # 7			1.22%	2.50%		1.00%
19	Mica	2.85%	1.00%	5.00%	2.14%	2.96%	3.00%
20	Aluminum Powder			0.09%			1.00%
21	Red Iron Oxide			0.36%			0.13%
22	Brilliant Rose			2.00%			0.85%
23	Brilliant Green	0.05%	0.05%	0.01%	0.05%		
24	Brown	0.90%	0.90%	0.10%	0.90%	0.90%	
25	Fast Black						
26	Fast Blue	5.00%	2.00%		3.37%		
27	Gold Orange			2.00%			0.85%
28	Magenta	8.00%	8.00%	0.10%	8.00%	8.00%	1.00%
29	Yellow			0.22%		3.12%	
30	Pink			1.89%	2.89%		2.00%
31	Turquoise Blue				3.50%		
32	Vermillion				0.14%		
33	Acrylic Resin	3.30%	3.30%	2.89%	3.30%	3.30%	3.30%
34	Petroleum Resin	2.85%	2.85%	2.98%	2.85%	2.85%	2.85%
35	Aromatic Solvent	2.16%	2.16%	1.97%	2.16%	2.16%	2.16%

36	Red Powder	0.10%	0.10%	3.00%	1.07%	0.10%	0.10%
37	Purple Powder	0.52%	0.52%	0.01%	0.52%	0.52%	0.52%
38	Blue Powder				0.13%		
39	Yellow Powder	0.98%	0.98%			0.98%	1.00%
40	Guanine	0.11%	0.11%	0.13%		0.11%	0.11%
41	Chromicolor	1.25%	1.25%	1.25%	1.25%	1.25%	2.00%
		100.00%	100.00%	100.00%	100.01%	100.00%	100.00%

Each formula was applied to a human nail and allowed to dry. The colors exhibited by the different formulae are shown in Table III.

Table III

	Formula					
	A	B	C	D	E	F
First color (normal body temperature)	Mauve	Medium Blue	Purple	Purple	Medium Pink	Neon Pink
Second color (above normal body temperature)	Silver Gray	Light Blue	Light Blue	Silver	White	Purple
Third color (UV exposure)	Mustard Gold	Green Gold	Green Gold	Dark Gold	Yellow	Red

The color changing nail polish has been described with reference to a particular embodiment. Other modifications and enhancements can be made without departing from the spirit and scope of the claims that follow.